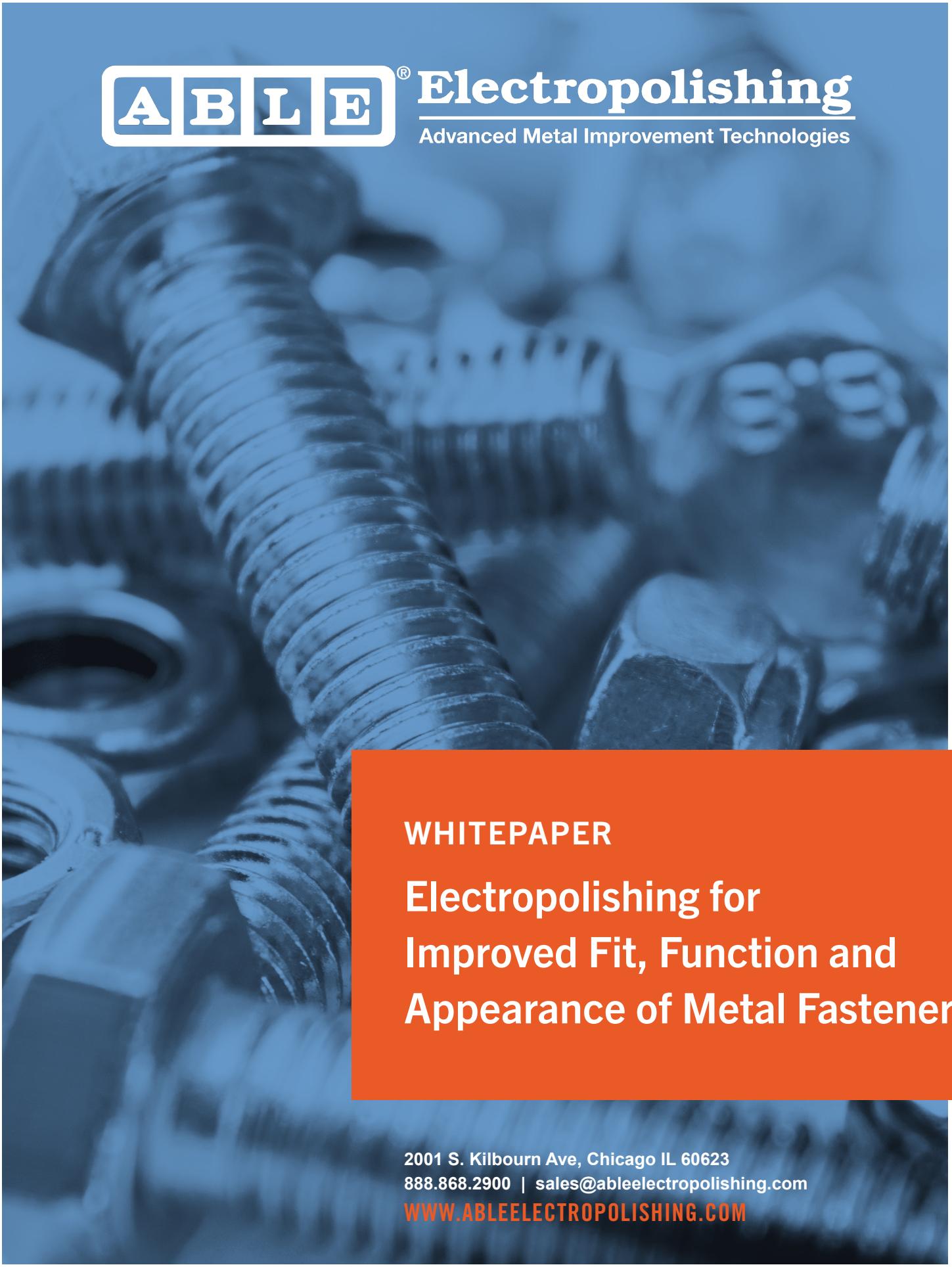

ABLE® Electropolishing

Advanced Metal Improvement Technologies

WHITEPAPER

Electropolishing for Improved Fit, Function and Appearance of Metal Fasteners

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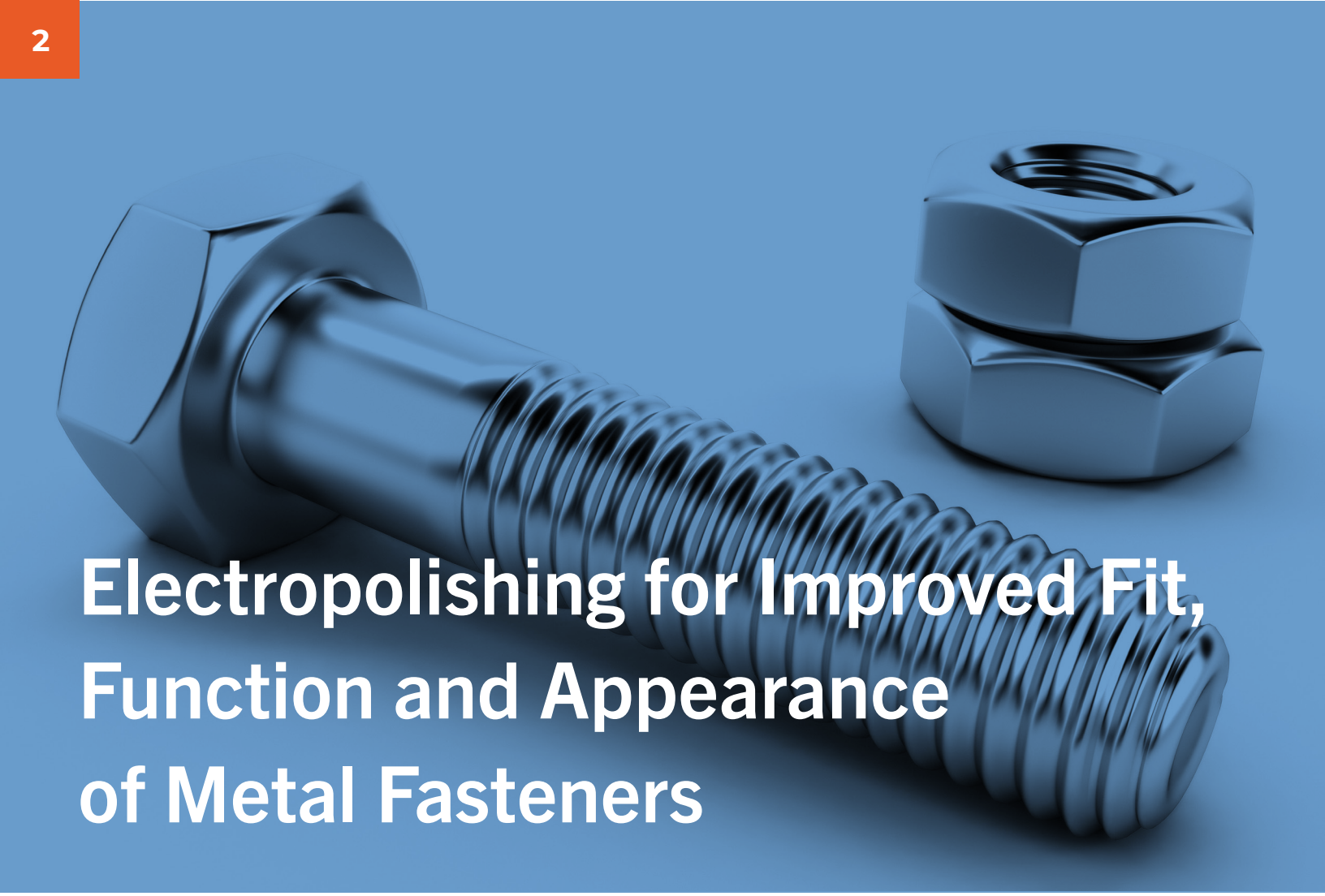


Electropolishing for Improved Fit, Function and Appearance of Metal Fasteners

Bolts, screws and other metal fasteners are essential to the structural integrity of a wide array of components, from steel fabricated structures to the infrastructure of public utilities.

A fastener with a poor finish or one that is prone to corrosion can threaten the integrity and safety of far more than a single bolt or screw. That is why the choice of finishing methods for metal fasteners is critical.

The options include a variety of methods, driven by factors that include appearance, the risk of corrosion and part failure, and cost-effectiveness.

For fasteners in applications where failure is not an option, electropolishing stands out for its ability to remove a microscopically precise amount of surface material, removing discoloration, contaminants and defects left behind by forging and machining, including microburrs, microcracks or scratches. The result is a shiny, ultrasmooth and defect-free surface that provides enhanced corrosion-resistance and decreased risk of part failure.

The precision and consistent results of electropolishing often make it a better option for the threaded surfaces of fasteners where tiny defects and impurities can lead to problems with fit and function.

How Does Electropolishing Work?

Electropolishing combines a chemical bath with an electrical current to remove a precise and consistent layer of surface material, leaving parts in a passive state and with 30x more corrosion resistance than passivation alone.

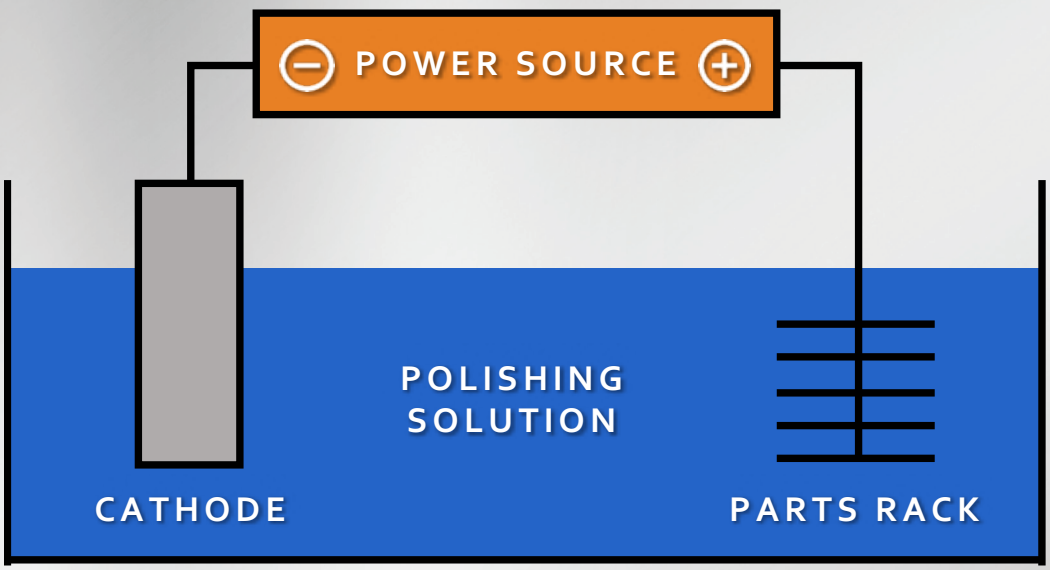
Electropolishing, also referred to as a "reverse plating process," combines a modified electrical current with a chemical bath to dissolve a microscopic, precise, and even layer of surface material.

A power source converts AC current to DC at low voltages and a series of copper or stainless-steel cathode plates is lowered into the bath and installed on the negative side of the power source. Then, the part – or a group of parts – is fixed securely to a rack made of titanium, copper, or bronze. This is lowered into the tank, fixed to the positive side of the power source, immersed in the chemical bath, and an electrical current is applied.

The reverse of electroplating

Uses a combination of chemicals and electrical current

A controlled surface defect removal process



The resulting bright surface is what helped give electropolishing its name

THE ADVANTAGES OF
Electropolishing for Fasteners

CORROSION RESISTANCE

Electropolishing removes a precise layer of surface material, eliminating defects, like microburrs, microcracks and contamination left behind by forging and machining processes that can become initiation sites for corrosion. Additionally, electropolishing improves the chrome to iron ratio on the surface, which greatly enhances corrosion resistance.

Electropolishing provides 30X the corrosion resistance vs. passivation alone

The ultrasmooth finish left behind by electropolishing provides superior corrosion resistance for a variety of metal alloys, including corrosive metals such as copper, brass, aluminum, and carbon steels. These benefits are particularly useful for marine applications, as well as fasteners used at or below ground level where moisture creates increased risk of corrosion.

PRECISION

Electropolishing removes a microscopically precise layer of surface material, leaving parts ultrasmooth and defect-free, with controlled stock removal of +/- .0002".

ELIMINATION OF GALLING

Galling is caused by the adhesion between two mating surfaces. When metal parts are tightly pressed together, the protective oxide coating of the metal begins to deteriorate as material settles between the two surfaces, causing the parts to seize up.

Electropolishing eliminates galling by deburring the threads, reducing the chances of adhesion and maintaining an ultraclean, corrosion-resistant metal surface.

HIGH SHINE

While function is critical, there are many applications where a high-shine appearance is also a desired attribute. Electropolishing removes staining and discoloration that occurs during heat treating or forging, leaving parts gleaming.

METAL REMOVAL = METAL IMPROVEMENT

CASE STUDY:

Birmingham Fastener

Brad Porter, Quality Manager at Birmingham Fastener, a leading manufacturer and distributor of fasteners based in Birmingham, Ala., has used Able to electropolish parts for nearly a decade. Specializing in parts for structural steel fabrication, transportation, water works and utilities, OEMs, and more, Birmingham uses electropolishing for finishing a variety of bolts, screws, and more.

Due to manufacturing techniques that combine forging and shot blasting, the metal fasteners can be left with discoloration and surface defects that impact durability and corrosion resistance. Electropolishing smooths the fasteners for improved corrosion resistance – a critical advantage for the company's water works customers.

> **"We used to use passivation, but it was just a dull finish that didn't look very good. I don't know who found Able for us to try the electropolishing route, but it's a night and day difference."**
>
> *- Brad Porter, Birmingham's Quality Manager*

Compared to passivation, which leaves parts with a dull finish, electropolishing creates the high shine that many clients value.

By removing a microscopically precise layer of surface material, electropolishing removes surface defects to leave parts with a superior finish that results in improved fit and function.

Porter's trust in Able's quality has allowed the company to skip the time-consuming and costly step of having electropolished parts shipped back to their headquarters for review. "We can always count on the quality to be there," said Porter. "We've started direct shipping to some of our customers from Able, without even seeing them."

Many of Birmingham's parts are made from forged materials such as 304 and 316 stainless steel, including rods, T-head bolts, oval-neck, and square-neck track bolts ranging in sizes from ⅜" up to 4" in diameter.

Able works closely with the Birmingham team to deliver on client needs, sharing up-to-date details regarding shipping, production, timelines, and any issues that occur – something that Porter says is greatly appreciated by Birmingham's shipping manager.

"He really likes the automated processing emails that we receive," said Porter. "He said it was really great communication – probably the best of all of our vendors."

Image Courtesy of Birmingham Fastener

Bulk vs. Rack: Which is better?

RACKING

At Able, we create custom racking for parts to improve the effectiveness of the electropolishing process. While both rack and bulk electropolishing can be effective, the rack process provides optimal results.

BULK POLISHING

With bulk polishing, parts are stacked into a single basket for processing, which creates inconsistencies in the amount of stock removal and the subsequent appearance of the parts. However, for manufacturers on a budget, bulk electropolishing is an economical way to brighten and passivate your fasteners, springs or other small parts. The process is best suited for 300 and 400 series stainless steel cylindrical parts that don't nest.

RACK POLISHING

Rack electropolishing ensures an even, consistent level of electrical contact as each part is evenly spaced. The electrical current and chemical flow is consistent across every part. For the highest level of precision, Able recommends rack electropolishing where stock removal can be controlled to +/- .0002"

Metal Alloys

Fasteners come in a large variety of materials that don't always react well to passivation.

Electropolishing can be used on a wide range of metal alloys, including:

- **Stainless Steel: 200-300 Series**
- **Stainless Steel: 400 Series**
- **Stainless Steel: Precipitating Hardening Grade**
- **Stainless Steel: Unusual alloys**
- **Nitinol**
- **Titanium**
- **Aluminum**
- **Brass**
- **Carbon Steels**
- **Copper**
- **Nickel**
- **Specialty Alloys**

BIRMINGHAM FASTENERS BEFORE AND AFTER

Regardless of fastener size or function, electropolishing works to remove discoloration and defects for a safer and more durable part.

HEX HEAD BOLT

T-HEAD BOLT

EP vs. Passivation for Fasteners

Electropolishing provides 30X the corrosion resistance vs. passivation alone

From titanium screws for medical implants to anchor and structural bolts for transportation, steel fabrication, waterworks and agricultural equipment, fasteners gain enhanced function and durability from the right finishing process.

While passivation is useful for removing free iron and contaminants, it's not as effective as electropolishing. The nitric solution used in passivation cleans without any stock removal and is less effective at imparting corrosion resistance or enhanced durability.

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ABOUT ABLE ELECTROPOLISHING INC.

Able is the world's largest electropolishing specialist, with over 220 employees and 15 robots working 24 hours, five days a week in our state-of-the-art Chicago facility. Founded in 1954, Able's processes have been honed in collaboration with engineers in industries with no room for error, including aerospace, medical device and national laboratories.

Our process includes consultation in the prototyping stage to ensure more effective finishing processes from the start. We make use of robotic automation to ensure consistently high-quality results across highly-customized processes.

Our Finish First methodology puts our expertise to work in the prototyping stage, with consultation designed to eliminate design flaws that can impact the finishing process. Our electropolishing and passivation processes meet the following standards: ASTM B912, ASTM A380, ASTM A967, AMS 2700, and more. To learn more about electropolishing for your critical metal parts, contact us today.

ABLE CUSTOMER PORTAL

The Able Electropolishing customer portal includes tracking and order tools that enable customers to monitor their parts shipments with one-click redirects to the UPS and FEDEX websites for detailed tracking information. Within the portal, customers can access estimated and actual shipping dates as well as track orders and backorders.

LUNCH ON US

Schedule a personal electropolishing Lunch & Learn session with our experts

- *Microsoft TEAMS Screenshare with Video chat*
- *You Choose DoorDash or Local Delivery*

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